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# MATERNAL HEMORRHAGE

## Quality Improvement Collaborative Lessons

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### Abstract

**Purpose:** The purpose of this study was to describe user experience with implementation of an obstetric hemorrhage toolkit and determine the degree of implementation of recommended practices that occurred during a 31-hospital quality improvement learning collaborative.

**Study Design and Methods:** This descriptive qualitative study included semistructured interviews with 22 implementation team leaders and review of transcripts from collaborative reporting calls recorded during the hemorrhage collaborative. Interviews included open-ended, closed, and ranking questions. Numeric responses were analyzed with descriptive statistics. Open-ended responses and call transcripts were analyzed thematically.

**Results:** Each of the 10 core toolkit components was ranked as currently "implemented" or "implemented and sustained" by at least 77% of interviewees. Most core elements were deemed "critical to retain." Respondents found debriefing the most difficult element of the toolkit to implement and sustain. Organizational context was the overarching theme regarding factors facilitating or constraining implementation. This included organizational structure and culture, previous experience with quality improvement, resources, and clinician engagement. Nurses were deeply involved in implementation and "physician buy-in" was a frequently mentioned facilitator when present and barrier when absent.

**Clinical Implications:** Greater understanding of and attention to organizational context and resources, greater appreciation for nursing involvement, and increased recognition of the role of organizational leadership are needed to facilitate widespread improvement initiatives in maternity care. Implementation science approaches may be useful in achieving national goals for maternal quality improvement and safety.

**Key words:** Maternal health; Patient safety; Postpartum hemorrhage; Quality improvement.

**F**rom 2002 to 2007, obstetric hemorrhage was a leading cause of maternal mortality in California (California Department of Public Health Maternal, Child and Adolescent Health Division, 2012). After historic improvements in maternal mortality in the 20th century, California's maternal mortality ratio rose steadily from a low of 7.7 deaths per 100,000 live births in 1999 to 16.9 deaths per 100,000 live births in 2006 (California Department of Public Health, 2010). California's rolling 3-year average rate of 14.0 for 2006–2008 followed the national trend (California Department of Public Health Maternal, Child and Adolescent Health Division, 2015). The United States maternal mortality ratio increased to 15.5 deaths per 100,000 live births in 2008 bringing local and national attention to the need to develop strategies for reversing this upward trend (California Department of Public Health, 2010; D'Alton, Main, Menard, & Levy, 2014).

In California, the Department of Public Health determined that the leading contributor to preventable deaths was obstetric hemorrhage (Mitchell et al., 2014). Thus, hemorrhage was selected as an important improvement opportunity for the State's ~250 hospitals that provide

care for women during ~500,000 annual births. The California Maternal Quality Care Collaborative (CMQCC) led development of a toolkit in 2009 to address better recognition of and response to obstetric hemorrhage, and used the Institute for Healthcare Improvement learning collaborative model to support implementation of the toolkit in 31 hospitals over a 1-year period (Bingham, Lyndon, Lagrew, & Main, 2011; Lyndon et al., 2010). Content and structure of the *Obstetric Hemorrhage Toolkit* later informed development of a national safety bundle for obstetric hemorrhage intended to be implemented in all birth settings (Main et al., 2015). User experience with the hemorrhage toolkit has not been evaluated. The purposes of this study

**Each of the 10 core toolkit components was ranked as implemented or implemented and sustained by at least 77% of interviewees, and most of the core elements were deemed critical to retain.**



were 1) to ascertain the extent to which users from the CMQCC improvement collaborative had implemented key recommended practices from the toolkit; 2) to support the recent toolkit revision process by identifying aspects of the toolkit users found most and least useful; and 3) to describe barriers and facilitators to toolkit implementation to inform future statewide and national improvement work in maternity care.

## Study Design and Methods

For this descriptive qualitative study, we interviewed a convenience sample of team leaders from the 31 hospitals that participated in the hemorrhage learning collaborative, and reviewed available transcripts and minutes of monthly reporting calls that occurred and were recorded in real time during the learning collaborative. The semi-structured interviews contained open-ended, closed, and ranking questions. Descriptive statistics were used to characterize responses to ranked questions. We evaluated open-ended interview responses and call transcripts using thematic analysis (Braun & Clark, 2006). Steps in this approach include reading and rereading transcripts; identifying units of meaning (codes) and patterns in the data, and organizing codes into larger themes; defining themes and relationships between concepts; and validating the themes by checking supporting data elements, range of variation, and salience.

We classified factors noted by participants as barriers and facilitators to implementation and identified emergent themes based on both the surface level and the underlying meaning of comments in interviews and calls. Thus, we looked at discreet barriers and facilitators to implementation as well as indications of the motivations and experiences of interviewees and call participants. We tracked sources for illustrative data elements throughout analysis to ensure representation of both registered nurses and physicians, and selected examples representing the range of voices in the dataset. Because the purpose of this investigation was to improve future toolkit development and uptake, the institutional review board determined this investigation to be a form of quality improvement and not human subjects research. Details of the learning collaborative and contents of the toolkit itself are outside the scope of this article. A description of the original toolkit development and implementation is available elsewhere (Bingham et al., 2011), and the toolkit contents are in the public domain at <https://www.cmqcc.org/resources-tool-kits/toolkits/ob-hemorrhage-toolkit>

## Results

Ten interview participants were from Northern California hospitals, 11 from Southern California hospitals, and one from Arizona. Thirteen interview participants were nurses, one was a public health project coordinator, and seven were physicians. Among nurse participants, three were directors or managers and 10 were clinical nurse specialists. Interviewees were highly experienced in their respective specialties: median years' experience was 23.5

(range 9–36 years). The portion of the collaborative for which we had call transcripts (seven) included 31 hospital teams. Calls were structured so that each team had the opportunity to report out, alternating between alphabetical and reverse-alphabetical order on each call.

Interviewees ranked perceived degree of implementation and the perceived usefulness of 10 core toolkit recommendations including routine admission risk assessment; routine active management of third stage of labor; quantitative blood loss (QBL) for vaginal birth, and for cesarean birth; adoption of a standardized hemorrhage protocol; training medical staff on use of intrauterine balloons and/or B-Lynch suture; deployment of hemorrhage carts; systems in place for massive hemorrhage; hemorrhage debriefings; and hemorrhage drills (see supplemental digital content Table 1 and Table 2, <http://links.lww.com/MCN/A32>). The majority of respondents (77% or higher) indicated that they had implemented or implemented and sustained each of the 10 recommended practices. Most respondents rated the 10 components as “very useful – critical to retain.” Two recommended practices were rated lower in both degree of implementation and usefulness: routine active management of the third stage of labor, and hemorrhage debriefings. Each of these two recommended practices was rated as critical to retain by 60% (13/22) of participants; however, reasons for lower enthusiasm for usefulness and lesser implementation were different.

Interviewees and call participants noted that routine active management of the third stage of labor was not a priority for many of their institutions because it was already part of routine practice prior to implementation of the hemorrhage toolkit. One interviewee also commented that several components of the active management practices at that time (fundal massage and cord traction) were under the direct control of the physician or midwife attending the birth and not easily documented or monitored by nursing staff, so were not particularly accessible as practices that could be audited for improvement.

*Management of the third stage was our other hard part. When we were trying to audit it, that really was a physician action, wasn't it? ... So the nurses really couldn't chart if the doctor really was doing gentle traction of the cord, but could chart if they saw them doing massage. [Nurse]*

Hemorrhage debriefing, on the other hand, was described as something respondents perceived as moderately to very useful, but difficult to implement and sustain over time, even in facilities with a high degree of implementation of other practices and extensive quality improvement/change management experience.

*I don't think you can have a toolkit without a debrief. I don't think you can have any of these and not make some effort to debrief. But as a bedside clinician in a busy Labor & Delivery unit, getting the parties to take a second to come together and quickly*

*review the event is very challenging. And I've never been successful in figuring out how to do it so that it's hard-wired and it's just done. [Nurse]*

### **Key to Implementation: Organizational Context**

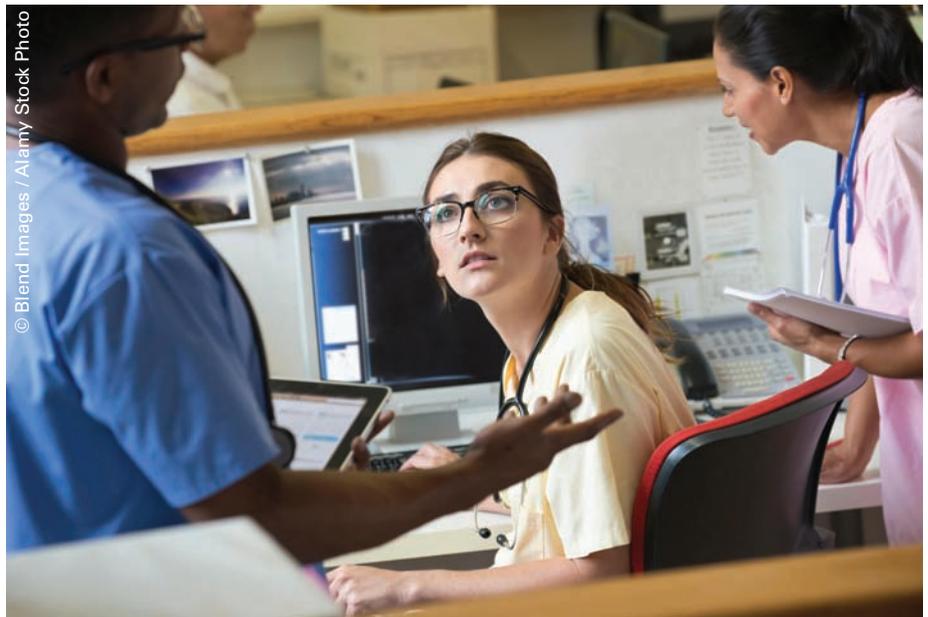
In much of the respondents' discussion and call transcripts, there were common issues that served to either help or hinder implementation of the toolkit by the end users. These issues all related to an overarching theme of organizational context, including local culture within the organization; local structure and experience of the implementation team; degree of administrative support there was for the team and the project in terms of resources for equipment, personnel, and data collection; existing resources already in place in a given institution; clinician engagement that was affected by relationships between different departments; quality of communication; and degree of hierarchy in existing relationships.

**Local culture.** As would be expected, users from organizations where there was already a strong safety or quality culture in place were typically experienced in change management and described having greater ease of implementation.

*It's the culture of the department of having the higher - the leaders of the department, whether they're formal leaders or informal leaders, just having the knowledge that this is where the state and the country is going, towards - and this is the reason that we're implementing these things. Kind of already having that understanding of quality improvement and safety and the importance of it....as opposed to a culture where they kind of wait for somebody else to tell them what should be done or what is being changed in the community. [Nurse]*

Experienced leaders were skilled at identifying their existing resources they could build upon, and in planning an approach to the work that would promote success. They spoke frequently of looking for "easy wins," things that were easy or relatively simple to implement in their organization; having a long-term outlook and plan; and communicating progress to their teams. Often, though not always, these experienced leaders had minimal difficulty getting the key stakeholders from obstetrics, nursing, anesthesia, and blood bank on board.

*I mean, to really be successful, we had the very highest levels of management supporting it, and so when I needed resources I was able to get them be-*



### **Hemorrhage debriefing was considered useful, but difficult to implement and sustain.**

*cause of the support. The other thing that made it successful is that we didn't just reinvent everything. Where we were already doing things, we used that. You know, where we already had a group doing multidisciplinary drills, we just went with that. We didn't have to reinvent that. So it's recognizing what you've already got using the resources you already have and having really good working relationships between the team, the leadership team. [Nurse]*

Additional aspects of local culture participants described as facilitating or hindering implementation were communication practices and the degree of intra- and interprofessional hierarchy and collaboration. Some facilities had a culture of openness and collaboration between departments, whereas others had less cooperation between departments and experienced challenges in interdepartmental problem solving.

*[A barrier in approving transfusion protocol] was the leadership role between the OB attendings and trauma. It was trauma physicians that caused the delay. I think it was just a professional matter of who's really in charge. [Call transcript]*

Participants noted that communicating practice changes required substantial tracking and follow-up with individual providers, and that poor interprofessional relationships created problems with executing desired practice changes.

*But there's always a certain amount of bad behavior, and we certainly had bad behavior from physicians who were unpleasant to nurses about [the implemen-*

tation]. So culture of hierarchy, culture of nurses who feel intimidated by physicians at a baseline because there's unpleasant interactions in the past or because maybe they're newer nurses. And then you get a guy who's just basically a jerk, you know - So those kinds of interactions have to be dealt with. [Physician]

**Administrative support and experience.** Administrative support and degree of previous experience with quality improvement and change management were important because there were multiple aspects of the toolkit that required significant interdepartmental work and cooperation to execute. For example, many facilities had already either partially or fully adopted electronic medical records. Thus, toolkit components like risk assessment and quantitative assessment of blood loss required collaboration with information technology departments and medical record programmers to become truly integrated into practice. Similarly, ensuring easy access to emergency medication requires collaboration with pharmacy and finding new ways of remaining compliant with regulations about medication storage and dispensing; implementation of massive transfusion protocols requires coordination with the blood bank. Tracking performance on any of these practices also requires interdepartmental cooperation.

*For example at a local level again, you have to go through steps. When we made up our hemorrhage cart, because it had medication, first we had to take it to our local Perinatal Committee and get it approved there and then we had to take it to the Pharmacy and Therapeutics Committee and get it approved there. You know, it's just the usual committees that you have to go through to get things approved is a barrier. [Physician]*

Some facilities began the project with considerable resources, such as existing massive transfusion protocols already in place, whereas others had to start from the beginning to develop this protocol and the corresponding interdepartmental cooperation. In some settings, blood bank leadership worried that the obstetric protocol parameters would interfere with meeting other pre-established quality indicators and resolving this required significant negotiation. Similarly, the overarching goals and priorities of the individual hospital or of a system of hospitals could serve to help or hinder implementation.

For hospitals with strong general or obstetric safety programs, the hemorrhage project aligned well with organizational priorities in a manner that facilitated implementation. In other situations, implementation teams found themselves competing for resources and attention with other major hospital initiatives such as renovations or moving to new facilities. Short-term priority shifts such as regulatory or accreditation visits could also present barriers to implementation. In particular, administrative support in the form of sustained provision of time and personnel to complete data collection, reporting, and the

tasks necessary to develop new processes and workflows made a significant difference in a unit's ability to carry through their implementation work.

*I think the leadership wasn't always on the same page, and that made it really difficult because I did a lot of education in implementing, "This is what we're going to do," but that piece about compliance really needed nursing leadership and they weren't always on the same page in terms of following through and helping to back up the education with, "Yes, you are going to do this." [Nurse]*

*So those kinds of data tracking on the unit are very much a challenge. Who pays for that? Who does that work? Who reports it? How do we get the word out to the people on the unit? If everyone else on the unit does not know how you're doing, then you're not doing very well. So we do have issues with that. [Physician]*

**Clinician engagement.** Engagement of a range of services and departments complicated the implementation process, because buy-in was needed from multiple groups including nurses, obstetricians, anesthesiologists, operating room personnel, blood bank, laboratory, and others. In some settings, engagement was problematic due to difficulty obtaining physical presence at meetings and education settings due to competing clinical demands. In other facilities, physicians and some nurses actively questioned need for practice changes related to obstetric hemorrhage, or there was a specific department that was harder to engage. Physician buy-in was frequently mentioned as either a facilitator or a barrier to implementation. In organizations with strong physician champions, implementation was facilitated. In many facilities, it was more difficult to engage either physicians generally or a specific group of physicians.

*We had some feet dragging from our anesthesiologists. They didn't seem to be as willing or open to working from an algorithm. They just wanted to kind of wing it and we were really trying to base our treatment based on blood loss and not wait for lab work or things like that. They weren't used to that. [Nurse]*

One strategy used to overcome this hurdle was to provide a lot of education about the current science behind the recommendations. However, this strategy itself also required strong physician championship in many settings, as in some organizations physicians were resistant to receiving that education from nurses.

### **Lessons Learned and Benefits of Collaborative Participation**

Participants on calls and in interviews were enthusiastic about participation in the collaborative. They repeatedly stated that the support they gained from other participants was extremely important, as was the accountability mechanism of peer reporting. Participants found that the

monthly reporting served several purposes: it pushed them to achieve more when others had successes, it provided a learning community from which they could get ideas for their own implementation, and it provided a source of encouragement when they saw that others struggled with the same issues they were struggling with:

*Well I think with the OB hemorrhage collaborative there was a lot we learned. I think just the simple camaraderie that you have on those calls where you're learning that you're not alone. You know, you struggle along and you think oh, things are happening so slowly here and we have so many roadblocks. And then you hear another person talk about their struggles and you think okay, I'm okay. I can do this....And then having the in-person meetings where people can share. I really like the atmosphere of collegiality where everyone is sharing openly. I think that's the wave of the future and it's wonderful. [Nurse]*

Interviews and sharing on the recorded calls made clear the importance of several issues, including the breadth of the team needed to make the changes necessary to fully implement the hemorrhage program; the importance of establishing goals and timelines and celebrating easy wins; using small tests of change to adapt practices before going live; and having fewer but concise and actionable measures for reporting. Of note, what constituted an “easy win” varied by facility: for example, in many settings, getting the hemorrhage cart organized and implemented was relatively simple to do, but in other facilities this was not the case. The key point was to identify what was likely to be “easy” in the local context, get that done quickly, and ensure credit for these accomplishments.

Particular challenges within the hemorrhage project and the collaborative structure included a lack of clarity around some of the expectations for practice change and the difficulty of obtaining some of the measures. Specifically, the Hemorrhage Task Force and the Expert Panel underestimated the complexity and contentiousness of quantifying (rather than the traditional approach of estimating) blood loss. For QBL, the recommendation was to weigh blood soaked materials because visual estimation of blood loss is known to be inaccurate. However, specifications for exactly how to conduct this practice were not particularly clear, and the intention of the recommendation to quantify blood loss was often subject to question from the implementation teams and local clinicians. In practice, clinicians needed more detailed resources about how to achieve QBL than “weigh blood soaked materials.” Lack of experience with routine weighing, equipment limitations, and the resources and practices within particular settings often made QBL more complex than anticipated.

*And then a huge part, of course, was the QBL, how to actually do QBL. We had a ton of problems with the original definitions of QBL and actually to this*

*day, we still are working on the nurses' understanding of direct measure when it comes to using the under-buttocks drape. It was just a huge problem and that whole complexity of[it]. [Nurse]*

*One of the barriers to mention on the QBL was the mindset of because I'm putting a number down, it has to be an exact number. So if it's not an exact number, we all know it's not exact — because there's still amniotic fluid and some of the blood we missed and some of the irrigation — so there was a big barrier mindset as to, well, I'm writing down a number and I'm saying it's quantified, and I'm going to be judged. [Physician]*

A persistent implementation challenge for collaborative participants was complexity of data collection requirements. There were initially over 21 individual elements for data collection around obstetric hemorrhage. Hospitals did not always have systems in place to be able to collect these data, some of which required labor-intensive chart reviews and hand calculations. In some instances, relationships with other departments were not strong and had to be developed to even begin discussing feasibility of obtaining the desired data. Users found the data collection portal time-consuming, and all data required manual data entry.

*[I]t's time consuming with our reports that we get for the hemorrhage and the accreta and things like that. They are coded, strangely, through our billing and coding department, so we have to go through and extract information out of each one, and we're working with them to try to refine that process. [Call transcript]*

*And there's so many barriers around the coding and identifying blood. There's just a lot of barriers around data collection. ...I think they underestimated how much time the data collection took, and we heard a lot of that. [Nurse]*

The need to work across departments in an integrated manner lead to one of the major learning opportunities: participants developed a new understanding of the differences in perspectives and goals across departments that could present barriers to the changes they wished to implement in their home departments. Participants had to ensure development of a shared understanding of the problem before they could make progress on actions requiring the cooperation of departments unfamiliar with maternity care.

*We learned a lot about how afraid everyone outside of OB is of pregnant patients and that, you know, they show up to help us and we're speaking a whole different language and they don't understand. ... So I would say that what we've learned is that people from different specialties view things very differently and*

*that it's really important when you have an obstetric patient that you involve the specialties you need but you keep the obstetric experts involved. [Nurse]*

The need to work across departments also facilitated the uptake of some practices across the local facilities, which served as positive reinforcement for the teams when they saw that the work they were doing excited other departments and influenced change outside of labor and delivery.

*I took [the debriefing form] ... and I modified it to make it more universal OB emergency, and then I also added "were people able to stay in their roles?" Because we actually created defined nursing roles to respond to OB emergencies. And the code team from the hospital loved it and they implemented it for the entire hospital for debriefing codes and rapid responses. [Nurse]*

*I think what came out of that is the rest of the hospital, we got kind of their attention, because maybe OB really does have something about blood loss. We became more credible to the rest of the agency, and all of a sudden they were calling us, asking us for information. And that was kind of a secondary gain that I didn't expect. [Nurse]*

## Clinical Nursing Implications

Participants in our study were positive about implementation of the hemorrhage toolkit and participation in the implementation collaborative. Participants appreciated

support provided by the collaborative for the complex, interdepartmental work that full toolkit implementation required. They appreciated learning from each other and they found the monthly reporting calls provided helpful accountability that pushed them to do more, as well as needed support and encouragement when they encountered roadblocks. Participants reported that the hemorrhage implementation work improved their unit's response to obstetric hemorrhage and influenced care in other areas as well as they applied similar improvement strategies to other aspects of care.

Our findings are consistent with the previous literature on bundle implementation showing that learning communities can provide both a healthy competition and support for problem solving (Dixon-Woods, Bosk, Aveling, Goeschel, & Pronovost, 2011; Dixon-Woods, Mc-Nicol, & Martin, 2012). Although some facilities participating in the collaborative were very experienced in change management and implementation of quality improvement initiatives, other facilities had less depth in this area. All of the call participants and interviewees expressed appreciation for the shared learning environment. However, Dixon-Woods et al. (2012) has shown that the supportive nature of the collaborative community cannot be taken for granted and can be undermined by excessive competition and negative influence. Thus, future improvement collaboratives might benefit from additional support in leadership and change management competencies, particularly to support the less experienced teams. Another area that deserves emphasis in future quality improvement initiatives is debriefing; a recommendation that users saw value in but had difficulty implementing. Debriefing is increasingly recommended in national programs. Kesler, Cheng and Mullan (2015) have outlined a process for implementing clinical debriefing in the Emergency Department that may be applicable to multiple clinical areas and could be used to guide implementation of routine debriefing of clinical incidents.

The importance of program leadership and organization context to bundle implementation noted by our participants has been recognized by other programs—for example, TeamSTEPPS has an organizational readiness assessment they ask teams to complete prior to registration (Agency for Healthcare Research and Quality, 2014)—and might explain some of the variability in effectiveness in taking Quality Improvement/Safety programs to scale. However, mechanisms by which these factors influence interventions are poorly understood and need to be developed for specific improvement packages (Øvretveit, 2011). This is an



**Clinician engagement in hemorrhage quality improvement work was affected by relationships between departments, quality of communication, and degree of hierarchy in existing relationships.**

## Suggested Clinical Implications

Multidisciplinary teams are essential for implementation of best practices in maternity care.

Nurses have a central role in implementation of best practices.

More support is needed for quality improvement activities in maternity care.

New strategies are needed for making clinical event debriefing routine.

Future learning collaboratives should consider building in more explicit leadership and change management material.

important area for future research and nurses should plan evaluations of the implementation process to coincide with implementation efforts to support this needed learning.

Future work in collaborative quality improvement could benefit from new approaches emerging in the implementation science movement. In particular, the emphasis in implementation science on using behavior change theory to design interventions at the individual and organizational level (Damschroder et al., 2009; Michie, Atkins, & West, 2014) might facilitate taking quality improvement to scale if collaborative developers consider how to build implementation plans that explicitly address behavior change to drive bundle implementation efforts. The national maternal safety bundles point to this with their emphasis on different levels of readiness, but they do not explicitly address the range of change management that may be needed. Change leaders (and those working on change teams) will need specific, targeted training on how to assess bundle fit and organizational readiness for the intervention; how to develop alignment between the bundle, individual users, and the organization; and how to make implementation changes and processes timely, focused, scalable, and sustainable. Our findings support importance of data and accountability as significant components of the program theory of how quality improvement collaboratives work (Dixon-Woods et al., 2011), but also highlight need for careful consideration of data collection infrastructure and feasibility of measures. (Damschroder et al.; Langley et al., 2009).

Limitations of our study include the time lag between collaborative work and evaluation and the focus on implementation team leaders versus the final end users: staff nurses, community-based physicians, and women who receive maternity care. Although CMQCC engaged multiple stakeholders in defining improvement objectives, developing best practices, and implementing those recommendations (Bingham et al., 2011), there is always more to be learned at the direct patient care interface. Future implementation initiatives should plan from the beginning to include robust ongoing stakeholder engagement in planning, execution, and evaluation. These activities would also be consistent with implementation science principles.

## Conclusion

Multidisciplinary teams are necessary to facilitate evidence-based changes across the spectrum of departments needed to coordinate integrated response to obstetric hemorrhage. Nurses were key facilitators of this process and critical to implementation and use of the toolkit elements. On calls and interviews, nurses were acknowledged by all to be carrying the majority of the implementation burden, and lack of physician participation was a significant barrier to implementation. More than half of the change agents interviewed were clinical nurse specialists: experts in coordinating practice improvement initiatives across disciplines. However, clinical nurse specialists and other nursing leaders will not be able to generate optimal performance on their own: they need support of facility and system administrators, resources and tangible support for data collection, and full cooperation and engagement from their physician colleagues. Facilities can make implementation more quickly when tools are provided that can be adapted to their facility and when communication channels are clearly defined. Collaborative leaders might facilitate implementation by working to define more clearly parameters for adaptation of bundle elements to the local environment; and providing more support for developing effective communication strategies as part of implementation efforts.

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